**In search for the oxygen isotopic composition of the solar component trapped in lunar metallic grains - Evidence of at least two extra-selenial components accreting on the Moon.** Ko Hashizume[1] and Marc Chaussidon[2], [1]Dept. of Earth & Space Sciences, Osaka University, Toyonaka, Japan (kohash@ess.sci.osaka-u.ac.jp), [2]CRPG-CNRS, Nancy, France (chocho@crpg.cnrs-nancy.fr).

The knowledge of the protosolar oxygen isotopic composition bears a key importance in constraining the origin and the formation pathways of the building blocks of planetary materials. This knowledge is also essential in discussing the timescales for formation and preservation of oxygen anomalies. We report here our recent progress towards the identification of the oxygen isotopic composition of the solar wind implanted in lunar regolith samples.

The surface of the Moon has been exposed over billions of years to irradiation by solar ions and to contributions of various extraterrestrial sources. Potential contributors include interplanetary dust particles and micrometeorites which dominate the present-day mass flux of meteoritic matter to the Earth's surface, meteorites and comets. For example, from studies of nitrogen isotopes among various lunar soils sampled at different locations, a competition of at least two fluxes with different origins accreting onto the moon surface was clearly observed [1]. The proportions of these components differed largely among samples, or grain-by-grain within the same sample. These proportions appear to differ among different elements, depending on their relative abundances in the respective fluxes and on their trapping mechanism into lunar samples. It is important to note that our current knowledge of the oxygen fluxes reaching the surface of the Moon is very poor, mainly because of the sparse available data. The goal of this study is to better determine the proportion of the different fluxes - potentially, solar, asteroidal and cometary - recorded among lunar grains in the case of oxygen, and to decipher the endmember solar isotopic composition.

Hashizume & Chaussidon (2005) [2] have previously reported the presence among metallic grains from lunar sample 79035 of an oxygen component enriched in $^{16}$O ($\Delta^{17}$O ( = $\delta^{17}$O - 0.52 x $\delta^{18}$O ) < -20 ± 4 ‰). Silicate grains from this sample were enriched in D-depleted hydrogen ($\delta$D < -930 ‰) [3] and solar noble gases [1], suggesting not only enrichment of the solar component in this sample, but a relatively low contribution of components that carry the D-rich hydrogen, like the asteroidal components. From this sample, we estimated the protosolar isotopic compositions of solar nitrogen [3] and carbon [4] and we interpreted that the observed $^{16}$O-enriched component had a solar origin. However, Ireland *et al.* (2006) [5] came to a contrasting proposition from the finding of a $^{16}$O depleted component ($\Delta^{17}$O = +26 ± 3 ‰) at the surface of metallic grains from lunar regolith 10084, which they likewise argued to have a solar origin.

To untangle this contradictory situation, we performed further isotope measurements of oxygen residing at the surface of lunar metallic grains. We measured grains on the same mount than used for our previous analyses [2], >200 metallic 79035 grains embedded in an indium plate, this time mainly small ones which were not previously measured, and also several grains from soil 71501. The two samples 79035 and 71501 were often measured in pair [1,3] for comparison, because of their rather contrasting nature, respectively being exposed at ancient time (1-2 Ga), or recently exposed (100 Ma), and respectively being relatively enriched in $^{14}$N and H, *i.e.*, the solar component, or in $^{15}$N and D (planetary component), though both samples are enriched in solar noble gases. We were able to reproduce the two extreme O components previously found [2,5]. The range observed this time was -11 ± 4 < $\Delta^{17}$O < +33 ± 3 ‰ (1$\sigma$). The negative $\Delta^{17}$O values were detected on grains from both 79035 and 71501 including one of the five grains for which we previously reported the negative values [2] and for which some part was left unsputtered. The positive values were observed among several newly measured 79035 grains. A marked difference discriminating these two components seems to be their concentrations. The maximum O concentration of the positive $\Delta^{17}$O component was as high as 10 wt%, whereas those for the negative $\Delta^{17}$O component were 1 wt% at most. From the solar $^{36}$Ar concentrations of single grain analyses of size sorted (175-250 $\mu$m) 79035 silicate grains [1], the solar oxygen concentration among grains from this sample is expected to be of the order of 1 wt%, or less. Following our previous argument [1], our current results suggest that the solar composition is likely enriched in $^{16}$O. Our results further confirm the supply to the Moon of two extra-selenial components with different origins.

**References:** [1] Hashizume *et al.* (2002) *EPSL*, 202, 201-216. [2] Hashizume & Chaussidon (2005) *Nature*, 434, 619-622. [3] Hashizume *et al.* (2000) *Science*, 290, 1142-1145. [4] Hashizume *et al.* (2004) *ApJ*, 600, 480-484. [5] Ireland *et al.* (2006) *Nature*, 440, 776-778.